

REMARKS

The Examiner is thanked for courtesies extended in granting an interview in the above captioned application to Dr. James Baker and the undersigned on April 14, 2005. During this interview, the history of advances in toner technology, particularly in the use of amphipathic copolymers in toners in the past and in currently pending patent applications, was discussed. The differences between copolymers prepared in aqueous media either as a suspension or emulsion polymerization reactions and amphipathic copolymers prepared in solvents as described in the present application were also discussed. The different development stages and toner discoveries for use in different printing processes were also discussed. Early systems were described having toner particles with very low Tg polymers that were imaged and adhesively transferred by an adhesive overlamine sheet. Liquid toners, including gels, were also discussed that comprised mid-range Tg toner particles that were formed a film on the photoreceptor and transferred as a film and subsequently fused to a substrate. Phase change developer systems were also discussed, wherein a toner is provided in a system that is solid at room temperature, but which is converted to a liquid toner, for example by heating, prior to imaging. The imaging process in the phase change developer system thus is a liquid toner system.

Issues related to creation of dry toner particles from toner particles prepared in liquids, and issues related to printing from liquid toner compositions without film formation on the photoreceptor were also discussed.

Amendments

Claims 1 and 12 have been amended to insert language regarding the S and D material portions of the amphipathic copolymer. Antecedent basis for this amendment is located in the specification at page 12, lines 12-16.

The specification has also been amended to update pending application status information.

It is respectfully submitted that no new matter is introduced by these amendments.

Claim Rejections

Claims 1 and 12 have been rejected under 35 USC 112, second paragraph as being indefinite.

More specifically, claims 1 and 19 have been stated to be indefinite in the terms S and D. These claims have been amended to relate these terms to the carrier liquid.

Claims 1-16 have been rejected under 35 USC 103 as being unpatentable over Baker 6,649,316 in view of Baker 5,698,616 and Baker 6,255,363.

The present claims relate to gel liquid electrophotographic toner compositions comprising a liquid carrier and toner particles dispersed in the liquid carrier. The liquid carrier has a Kauri-butanol number less than 30 mL. The toner particles comprise a polymeric binder comprising at least one amphipathic copolymer with one or more S material portions and one or more D material portions. The S material portion of the copolymer has molecular weight and solubility properties selected to provide a three dimensional gel of controlled rigidity which can be reversibly reduced to a fluid state by application of energy. The electrophotographic toner composition does not form a film under Photoreceptor Image Formation conditions.

Gel toner compositions that do not substantially form a film under Photoreceptor Image Formation conditions provide specific advantages, including excellent image transfer from the photoreceptor, with low or no back transfer of the image to the photoreceptor during the printing process. Additionally, the gel toner compositions exhibit exceptional storage stability without the need to incorporate dispersant, surfactant, or stabilizer additives in an amount deleterious to image quality, although these additional components can be used if desired. Superior final image properties are also observed relative to erasure resistance and blocking resistance. The gels impart useful properties to the liquid ink, notably improved sedimentation stability of the colorant, without compromising print quality or ink transfer performance. The inks formulated with the gels also exhibit improved redispersion characteristics upon settling, and do not form dilatant sediments such as those formed by non-gelled organosol inks.

Baker 6,649,316 describes a phase change developer comprising: (a) a carrier having a Kauri-butanol number less than 30; and (b) an organosol comprising a graft (co)polymeric steric stabilizer covalently bonded to a thermoplastic (co)polymeric core that is insoluble in said carrier, and said (co)polymeric steric stabilizer comprises a crystallizing polymeric moiety that

independently and reversibly crystallizes at or above 30°C, wherein said phase change developer has a melting point at or above 22°C.

As noted in the Baker '316 specification beginning at column 11, line 52, the term "phase change developer" has an accepted meaning within the imaging art. As the term indicates, the developer system is present as one physical phase under storage conditions (e.g., usually a solid) and transitions into another phase during development (usually a liquid phase), usually under the influence of heat or other directed energy sources. Thus, in the system as described in Baker '316, the toner is converted from a solid form to a liquid form prior to development, so that the toner as described first is in the solid form, and then through a specific manipulation is converted to liquid form under image formation conditions so that the actual image formation process is carried out in the form of a liquid. See column 2, lines 21-25. This solid form is fundamentally different in nature from a gel created by molecular weight and solubility properties as required in the present claims.

Baker '316 therefore does not teach or suggest a gel toner composition comprising a gel created by molecular weight and solubility properties in the amphipathic copolymer in an amount to provide a three dimensional gel of controlled rigidity which can be reversibly reduced to a fluid state by application of energy as presently claimed.

Additionally, Baker '316 describes a toner system wherein the toner is designed to form an image on the surface of a photoconductor with film formation on the photoconductor, which formed film is then transferred to an intermediate transfer material or directly to a print medium. See, e.g. Column 14, lines 64-65, which describes the drying of the film on the photoconductive element surface. This image formation system is in contrast to the presently claimed system, which specifically requires that the electrophotographic toner composition does not form a film under Photoreceptor Image Formation conditions.

Similarly, Baker '616 describes a toner system wherein the toner is designed to form an image on the surface of a photoconductor with film formation on the photoconductor, which formed film is then transferred to an intermediate transfer material or directly to a print medium. See, e.g. Column 12, lines 1-6 and column 17, lines 23-25 and line 40, which describe the drying of the film on the photoconductive element surface. See also column 5, lines 63-66 and column 11, lines 48-50, which discuss rapid self-fixing. The image formation system described in Baker '616 is thus in sharp contrast to the presently claimed system, which specifically requires that the

electrophotographic toner composition does not form a film under Photoreceptor Image Formation conditions. The skilled artisan would not have predicted that one could make such a gel composition that simultaneously does not form a film under Photoreceptor Image Formation conditions, and would not have been motivated to do so from the Baker '616 disclosure.

Baker '363 similarly discloses a toner system wherein the toner is designed to form an image on the surface of a photoconductor with film formation on the photoconductor, which formed film is then transferred to an intermediate transfer material or directly to a print medium. See, e.g. Column 12, lines 6-12 and column 18, lines 25-26 and line 40, which describe the drying of the film on the photoconductive element surface. See also column 6, lines 11-13 and column 11, lines 52-60, which discuss rapid self-fixing. The image formation system described in Baker '363 is thus in sharp contrast to the presently claimed system, which specifically requires that the electrophotographic toner composition does not form a film under Photoreceptor Image Formation conditions. The skilled artisan would not have predicted that one could make such a gel composition that simultaneously does not form a film under Photoreceptor Image Formation conditions, and would not have been motivated to do so from the Baker '363 disclosure.

It is respectfully submitted that the above discussed references would not have individually or in combination suggested the toner compositions of the present claims. Further, the skilled artisan would have had no motivation to prepare a gel toner composition as presently claimed, wherein a reversible gel having the present performance properties is formed through selection of S material portions of the copolymer in molecular weight and solubility properties to provide a three dimensional gel of controlled rigidity. The references do not teach or suggest preparation of a gel toner composition that substantially does not form a film under Photoreceptor Image Formation conditions, as required in the present claims.

Finally, the skilled artisan could not have predicted that such toner compositions would exhibit superior performance properties, such as excellent image transfer from the photoreceptor, exceptional storage stability, and superior final image properties relative to erasure resistance and blocking resistance.

Claim Rejections – Double Patenting

Claims 1-16 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-24 of copending Application Nos. 10/612,533 and 10/612,058 and 10/612,444.

In order to overcome this provisional rejection and to expedite prosecution, a terminal disclaimer in view of copending Application Nos. 10/612,058 and 10/612,444 is enclosed without prejudice.

Claims 1-16 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-22 of copending Application No. 10/612,533.

This double patenting rejection is respectfully traversed.

Application No. 10/612,533 relates to a liquid electrophotographic toner composition comprising a liquid carrier having a Kauri-Butanol number less than about 30 mL and a plurality of toner particles dispersed in the liquid carrier that comprise polymeric binder comprising at least one amphipathic copolymer comprising one or more S material portions and one or more D material portions. In this system, one or more of the S or D material portions comprises the residue of a Soluble High T_g Monomer having a T_g at least about 20°C. The absolute difference in Hildebrand solubility parameters between the Soluble High T_g Monomer and the liquid carrier is less than about 3 MPa^{1/2}, and the D portions of the amphipathic copolymer each have a T_g at least about 30°C.

There are a number of differences between the claims of the respective patent applications that make them quite different in character, so that linking these applications by Terminal Disclaimer is manifestly improper. While the present application relates to a gel toner composition that substantially does not form a film under Photoreceptor Image Formation conditions, the reference application relates instead to a liquid toner composition having a surprising selected component in the amphipathic copolymer which is a Soluble High T_g Monomer. As noted in the reference application, images formed from compositions as described therein surprisingly have excellent transfer under relatively low fusion temperature conditions, and yet are surprisingly resistant to blocking, are surprisingly non-tacky and are resistant to marring and undesired erasure.

Because the compositions as described in these two patents are so different in nature, Applicants respectfully request withdrawal of this Obviousness type Double Patenting rejection.

CONCLUSION

In view of the above remarks, it is respectfully submitted that the foregoing is fully responsive to the outstanding Office action. In the event that a phone conference between the Examiner and the Applicant's undersigned attorney would help resolve any issues in the application, the Examiner is invited to contact said attorney at (651) 275-9811.

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Respectfully Submitted,

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